CLAIMS

What is claimed is:

1. A system for manipulating data in a state holding elements array, the system comprising:

a process controller for moving process data through an array of processing units coupled to a state holding elements array;

a scan controller for scanning scan data out of the state holding elements array, the scan controller including:

a cascaded group of state holding elements, each of the state holding elements being a single unpaired state holding element;

a clock shifter for controlling movement of data out of each state holding element in the cascaded group; and

means for permitting shifting of a datum from a first state holding element in the cascaded group to a second state holding element in the cascaded group only if the second state holding element does not contain a valid datum at that time; and

a controller coordinator for controlling a mutually exclusive operation of the process controller and the scan controller.

2. The system of claim 1, wherein the clock shifter comprises:

a plurality of clock AND gates;

a same clock input line connected to multiple clock AND gates in the plurality of clock AND gates; and

a plurality of clock latches each having:

a control input connected to an output of another clock latch,

a clock input connected to the same clock input line, and

a clock latch output each connected to one of the multiple clock AND gates,

wherein the clock shifter splits a same clock input into sequentially propagating clock signals, such that at a first time, only a first clock AND gate in the multiple clock AND gates outputs a first cycle of a clock signal, and at a second subsequent time the first clock AND gate and a second clock AND gate output a second cycle of the clock signal.

3. The system of claim 1, further comprising:

an output register comprising a plurality of receiving latches, each receiving latch being connected to a scan-out end of one of the rows of state holding elements.

4. The system of claim 1, wherein the state holding elements are latches.

5. A method for manipulating data in a state holding elements array, the method comprising:

enabling a process controller, coupled to a state holding elements array, to move process data through an array of processing units coupled to the state holding elements array;

enabling a scan controller, coupled to the state holding elements array, to scan data out of the state holding elements array, the scan controller:

shifting a first valid datum out of a downstream state holding element in a cascaded group into a state holding element of an output register, the cascaded group including a plurality of single unpaired state holding elements;

subsequently shifting a second valid datum from an first upstream state holding element into the downstream state holding element; and

subsequently shifting a third valid datum from a second upstream state holding element into the first upstream state holding element, whereby each shift of valid data is into a holding element that does not contain valid data at the time of the shift; and

enabling a controller coordinator to control a mutually exclusive operation of the process controller and the scan controller.

6. The method of claim 5, further comprising:

controlling a timing of the shifting of the data out of the cascaded group such that the shifting ends when all data is shifted out of the cascaded group.

7. The method of claim 6, further comprising:

shifting new data, from an input register, into the cascaded group such that each state holding element in the cascaded group contains unique data.

8. A computer program product, residing on a computer usable medium, for manipulating data in a state holding elements array, the computer program product comprising:

program code for enabling a process controller, coupled to a state holding elements array, to move process data through an array of processing units coupled to the state holding elements array;

program code for enabling a scan controller, coupled to the state holding elements array, to scan data out of the state holding elements array, the scan controller:

shifting a first valid datum out of a downstream state holding element in a cascaded group into a state holding element of an output register, the cascaded group including a plurality of single unpaired state holding elements;

subsequently shifting a second valid datum from an first upstream state holding element into the downstream state holding element; and

subsequently shifting a third valid datum from a second upstream state holding element into the first upstream state holding element, whereby each shift of valid data is into a holding element that does not contain valid data at the time of the shift; and

program code for enabling a controller coordinator to control a mutually exclusive operation of the process controller and the scan controller.

9. The computer program product of claim 8, further comprising:

program code for controlling a timing of the shifting of the data out of the cascaded group such that the shifting ends when all data is shifted out of the cascaded group.

10. The computer program product of claim 8, further comprising:

program code for shifting new data, from an input register, into the cascaded group such that each state holding element in the cascaded group contains unique data.